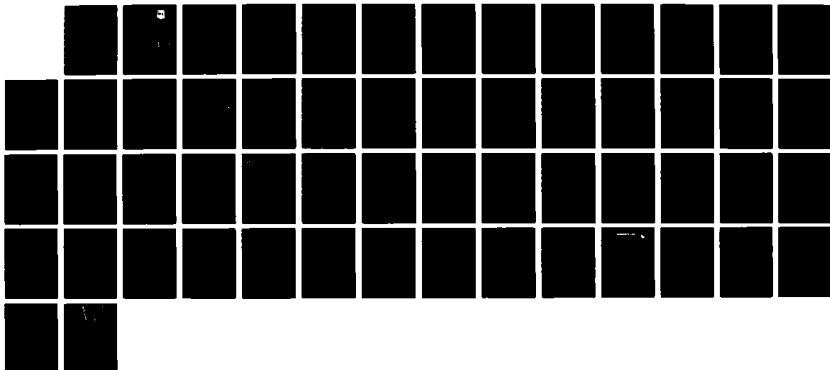
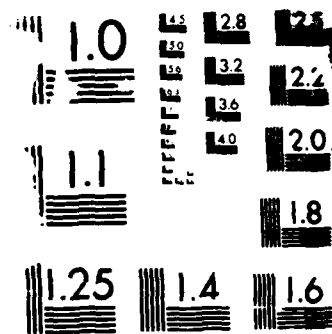


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USAFOEHL REPORT

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**HAZARDOUS WASTE STAFF ASSISTANCE SURVEY,
PATRICK AFB AND CAPE CANAVERAL AFS, FLORIDA**

ELLIOT K. NG, MAJ, USAF, BSC

ROBERT A. TETLA, 1LT, USAF, BSC

March 1987

Final Report

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**USAF Occupational and Environmental Health Laboratory
Aerospace Medical Division (AFSC)
Brooks Air Force Base, Texas 78235-5501**

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EXECUTIVE SUMMARY

The combined efforts of Air Force, NASA and contractor personnel have resulted in a comprehensive and effective hazardous waste program to manage and minimize hazardous waste at Patrick AFB and Cape Canaveral AFS. The program managers are now exploring opportunities for refinement. These opportunities should include certification of the Air Force Management Laboratory for hazardous waste analysis, documentation of waste analysis procedures, expansion of analytical capability, reduction of the numbers of used oil analysis, and operation of a solvent recovery unit at Cape Canaveral AFS.

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I. INTRODUCTION

In a 5 May 86 letter (Appendix A), Headquarters Air Force Systems Command Bioenvironmental Engineering, HQ AFSC/SGPB, requested the USAF Occupational and Environmental Health Laboratory, Consultant Services Division, Environmental Quality Branch, USAFOEHL/ECQ, accomplish a hazardous waste staff assistance survey at Patrick Air Force Base (PAFB) and Cape Canaveral Air Force Station (CCAFS). The scope of this survey was to address hazardous waste management practices as well as explore opportunities for hazardous waste minimization.

The survey was conducted by Major Elliot K. Ng and 1Lt Robert A. Tetla, USAFOEHL Hazardous Waste Function, USAFOEHL/ECQ, from 14 Jul 86 to 25 Jul 86.

II. BACKGROUND

A. Base Description

Patrick AFB is located between Cocoa Beach and Satellite Beach, Florida and is the site for Headquarters Eastern Space and Missile Center (ESMC). The base serves as a host unit for various tenants, such as the 6550th Air Base Group (ABG), the 6555th Aerospace Test Group (ASTG), and the Eastern Test Range (ETR). The mission at PAFB is to support the missile and space launch programs at Cape Canaveral AFS and at John F. Kennedy Space Center (KSC), National Aeronautics and Space Administration (NASA).

Cape Canaveral AFS is located fifteen miles north of PAFB. The mission at CCAFS is to test, assemble, checkout, and launch military and nonmilitary missiles and spacecraft.

B. Hazardous Waste Program

The hazardous waste program at PAFB and CCAFS is atypical. The program is a result of integrated efforts by the Air Force, contractors, and NASA personnel. Basically, the Environmental Planning Office at PAFB, 6550 ABG/DEEV, is ultimately responsible for managing hazardous wastes generated by the Air Force and contractors at both PAFB and CCAFS. This includes hazardous wastes generated by the Navy Ordnance Test Unit (NOTU) located at Port Canaveral. However, the actual management of hazardous waste at CCAFS and Port Canaveral is performed through a contractor, Pan American (Pan Am) World Services, Inc.

The day-to-day management of hazardous waste at both PAFB and CCAFS is based on substantial input from the Waste Management Authority (WMA) at KSC, currently Edgerton, Gershehausen, and Greer (EG&G) of Florida. Initially, each identified waste stream is evaluated by EG&G using a Process Waste Questionnaire (PWQ), KSC Form 26-551, (see Figure 1), submitted by the waste generator in conjunction with results from waste analyses. The PWQ includes such pertinent information as organizational contacts, process description, physical and chemical description of the waste, current disposal method,

virgin chemicals used in the process, and forecasted volume of waste generation. After an initial waste evaluation, EG&G returns a "PWQ Technical Response Package" to the waste generator. This package includes a unique process code assigned to the waste stream, waste container information, labeling requirements, properties of the waste, sampling frequency and routine analyses required, and a sample of a completed manifest. Thereafter, the waste generator must resubmit a PWQ annually to EG&G for reevaluation or sooner, if there is a change in the process or operation, or if a discrepancy exists between the United State Environmental Protection Agency (EPA) uniform manifest completed by the installation and the waste analysis performed by an off-site waste disposer.

When a drum of waste is ready for disposal, the waste generator notifies the accumulation point manager to contact Cape Support (operated by Pam Am) at CCAFS. Subsequently, Cape Support contacts Wiltech, the current contractor, to pick up and, if necessary, sample the waste. If analysis is required, Wiltech will collect sample(s) and deliver the sample(s) directly to the Energy Management Laboratory, an Air Force Logistics Command Laboratory located at CCAFS. This laboratory is responsible for analyzing waste samples from PAFB, CCAFS, NASA and sometimes other bases. After an analysis is completed, the results are forwarded to the waste generator and EG&G. Upon receipt of results, EG&G determines if the waste is hazardous and the proper disposition of the waste. If off-site hazardous waste disposal is required, EG&G fills out the EPA uniform manifest.

III. PROCEDURE

The first step of the survey was to establish the major categories of waste generated at PAFB and CCAFS. To accomplish this task, data on waste quantities were extracted from the ECMS's Draft Petroleum Products and Hazardous Waste Management Plan, OPLAN 19-14, 30 April 86, Appendix A, Generator/User Waste Forecast Calendar Year 1986. Listed in Table 1 are the 17 categories of waste finally established along with the annual forecasted quantity for each category from PAFB and CCAFS. From Table 2, Column 4 (see Appendix B for calculations), over 93% of the wastes generated at PAFB and CCAFS are bilge waste, used oils, used fuels, and propellant type wastes. Fortunately, the handling of these four major waste categories are well established. Bilge waste, the largest waste category, is mostly water with minimal amounts of oil and is currently taken to an oil/water separation system at Complex 15 at CCAFS. The recovered oil skimmed from this separation system is taken to Complex 34 at CCAFS along with uncontaminated used oils for further water separation. All oil recovered at Complex 34 is taken to the CCAF's heating plant and used as fuel.

TABLE 1
CATAGORIES OF WASTE AT BOTH PATRICK AFB (PAFB)
AND CAPE CANAVERAL AFS (CCAFS)

CATEGORY	PRODUCT	PAFB (gal/yr)	% FROM PAFB	CCAFS (gal/yr)	% FROM CCAFS	TOTAL (gal/yr)
1	BILGE WASTE	0	0	250000	100	250000
2	USED OILS	16990	59	11882	41	28872
3	USED FUELS	25310	84	4752	16	25782
4	PROPELLANT	0	0	19000	100	19000
5	PAINTS AND SOLVENTS	1820	22	6325	78	8145
6	HYDRAZINE	0	0	3001	100	3001
7	RINSEWATER	3000	100	0	0	3000
8	ACIDS	1280	67	628	33	1908
9	TRIDENT WHARF	0	0	1700	100	1700
10	FLUIDS	0	0	1350	100	1350
11	SILVER	1300	100	0	0	1300
12	CAUSTIC	500	53	451	47	951
13	SYNTHETIC OIL	900	100	0	0	900
14	ALODINE	600	70	255	30	855
15	MISCELLANEOUS	0	0	655	100	655
16	ETCHANT	0	0	430	100	430
17	CUTTING OILS	0	0	110	100	110
TOTALS:		51700		300539		352239

TABLE 2
AMOUNT OF WASTE FROM BOTH PATRICK AFB
AND CAPE CANAVERAL AFS

CATEGORY	PRODUCT	AMOUNT (gal/yr)	% TOTAL CATEGORIES 1-17	% TOTAL CATEGORIES 5-17
1	BILGE WASTE	250000	70.975	0.000
2	USED OILS	28872	8.196	0.000
3	USED FUELS	30062	8.534	0.000
4	PROPELLANT	19000	5.394	0.000
5	PAINTS AND SOLVENTS	8145	2.312	33.512
6	HYDRAZINE	3001	0.852	12.347
7	RINSEWATER	3000	0.852	12.347
8	ACIDS	1908	0.542	7.850
9	TRIDENT WHARF	1700	0.483	6.994
10	FLUIDS	1350	0.383	5.554
11	SILVER	1300	0.369	5.349
12	CAUSTIC	951	0.270	3.913
13	SYNTHETIC OIL	900	0.256	3.703
14	ALODINE	855	0.243	3.518
15	MISCELLANEOUS	655	0.186	2.695
16	ETCHANT	430	0.122	1.769
17	CUTTING OILS	110	0.031	0.453
TOTALS:		352239	100.000	100.004

Similarly, uncontaminated used fuels are recovered and reused while contaminated used fuels are used in the fire training pit at PAFB. Finally, propellant wastes consist largely of water with trace amounts of propellants. These wastes are diluted if necessary before being transported by GSX, a hazardous waste disposal contractor, to South Carolina for incineration. Upon deletion of bilge waste, used oils, used fuels and propellant waste, the relative quantities of the remaining waste categories (5-17) were recalculated. The results are in Table 2, Column 5, and reveal that over 66% of the remaining wastes are in categories 5, 6, 7 & 8.

After the preliminary waste quantity assessment, the survey team proceeded to visit all major industrial shops on PAFB and CCAFS to observe the industrial activities and to discuss with shop personnel industrial waste disposal practices. The following individuals were contacted to discuss their respective areas of responsibility in the hazardous waste program:

Capt Randolph Wolf, Base Bioenvironmental Engineer, ESMC/SGPB, PAFB,
AV 854-5436

Mr Warren Bradford, Chief, Environmental and Contract Planning,
6550 ABG/DEEV, PAFB, AV 854-7288

Ms Ginger Crawford, Environmental Engineer, 6550 ABG/DEEV, PAFB,
AV 854-7288

Mr Chis Holland, Environmental Engineer, Pan Am, CCAFS, AV 467-7527

Mr Tim Rudolph, Environmental Engineer, Pan Am, CCAFS, AV 467-7527

Mr Jack Thomas, Engineer, EG&G, KSC, (305) 867-2518

Ms Mary Taylor, Senior Engineer, EG&G, KSC, (305) 867-2518

Mr Salvador Restizo, Chief, Energy Management Laboratory, CCAFS,
AV 853-5441

Mr Paul Huff, Chemist, Energy Management Laboratory, CCAFS, AV 853-5441

IV. DESCRIPTION OF INDUSTRIAL ACTIVITIES AND WASTE DISPOSAL PRACTICES

A. Patrick AFB

1. 6550 ABG, Civil Engineering Paint Shop, Building 324
Contact: Mr Madden or Mr Smith, AV 854-4618

This shop is responsible for small paint jobs like painting signs and panels and touch-up painting, and is in the process of going contract.

Materials used in this shop include: polyurethane paints and catalysts, zinc chromate primer coating, and toluene and xylene to clean brushes. This shop averages five to six 55-gallon drums of paint waste per year which are disposed of as hazardous waste.

2. 549th Consolidated Aircraft Maintenance Squadron (CAM), Aircraft Ground Equipment Shop (AGE), Building 691
Contact: TSgt Butler, AV 854-4705/4777

Personnel in this shop maintain all aircraft ground equipment. Routine repair and maintenance are performed on light stands, AGE equipment,

power generators and scaffolds. The wastes generated by this shop include engine, synthetic, and hydraulic oils, PD-680 and fuels. This shop serves as the waste collection point for all shops in 549 CAM. In addition, this shop has an underground fuel filtering system to recover uncontaminated used fuels.

3. 549 CAM, Battery Shop, Building 702
Contact: Sgt Williams, AV 854-2729

This shop inspects, repairs and services Nicad and lead acid batteries in support of the flying mission. Personnel fill Nicad batteries with very small amounts of potassium hydroxide and fill lead acid batteries with sulfuric acid. About six to eight gallons of sulfuric acid are used per month when servicing lead acid batteries. The spent sulfuric acid is neutralized with baking soda and further diluted with water before discharging into the sanitary sewer.

4. 549 CAM, Corrosion Control Shop, Building 647
Contact: Sgt Lamb, AV 854-6730

This shop performs corrosion control on the following aircrafts: OV-10, U-2, and CH-3E helicopters. Shop duties include: Paint preparation (sanding, applying alodine), primer painting, painting (polyurethane and enamel paints, PD-680, toluene and xylene as thinning agents and polyurethane catalyst), paint stripping (naptha) and aircraft washing. Types of wastes from this shop are as follows: paint and stripping wastes, PD-680 and methyl ethyl ketone (MEK). These wastes are placed in 55-gallon drums and sent to 549th CAM, AGE, Building 691, for storage before disposal as hazardous waste.

5. Detachment 5 (DET 5), Hangar 986
Contact: TSgt Olp, AV 854-7142

Personnel in this hangar are responsible for the maintenance of the U-2 aircraft. Maintenance on the aircraft includes painting and engine upkeep. Wastes from this shop include: fuel (JP-4), synthetic and hydraulic oils from engines, paint wastes (paints and MEK), and PD-680. The wastes are stored in 55-gallon drums outside Hangar 985 along with wastes generated from Detachment 15. These wastes are either sent to the Defense Reutilization Management Office (DRMO) for resale, e.g., synthetic oils, or picked up by Wiltech for off-site disposal.

6. Detachment 15 (DET 15), 39th Aerospace Rescue and Recovery Wing, Hangar 985
Contact: SSgt Poll, AV 854-5022

Wastes generated from this shop come from maintenance on the CH-3E "Jolly Green" helicopters. Wastes include: fuels drained from the helicopters, synthetic and hydraulic oils from gear boxes of the helicopters and some PD-680. These wastes are segregated and stored in 55-gallon drums outside this hangar prior to pick up by Wiltech.

7. 2nd Combat Information Systems Group (MOB); Building 630
Contact: Sgt Benjamin, AV 854-2307

The mission of the MOB is to provide and service equipment in support of worldwide Air Force requirements for communications, navigational aids and air traffic control according to war plans, contingency plans, and emergencies. Wastes from this shop include fuels, lube oils and PD-680. These wastes are placed in 55-gallon drums and picked up by Wiltech.

8. Power Production Section, Building 1350
Contact: TSgt Woodell and Mr Becker, AV 854-4477/2605

Shop personnel provide emergency power for the base in case of power outages during wartime. Wastes are generated from the upkeep of generators and include: engine oil, battery acid, diesel fuel and antifreeze. All wastes are stored in 55-gallon drums and taken to the hazardous waste storage facility at Building 958 where these drums are sampled before being transported by Wiltech for disposal.

9. RCA Mount Shop, Building 96
Contact: Mr Smith or Mr Rowell, AV 854-5217/5928

Personnel in this shop remove paint from antenna, antenna parts and downrange equipment used in tracking and data gathering. This shop uses B&B-120 NP, a cold carbon, nonphenolic premixed stripper, to remove the paint from the equipment. This stripper is stored in a large 400-gallon tank (changed out two to three times a year) in which equipment is allowed to soak. Afterward, the equipment is removed from the stripper tank and allowed to drip dry before being hosed down at the rinse tank to remove loose paint and stripper (See Figure 2). The rinsewater is stored in a rinsewater tank and will be disposed of by contract as hazardous waste. Recently, a sample was taken of the rinsewater for hazardous waste analysis.

Several improvements to this facility are currently at the design stage. For example, a cover is going to be placed over the rinsewater tank to prevent rainwater from coming in contact with contaminated rinsewater resulting in increasing the quantity of waste.

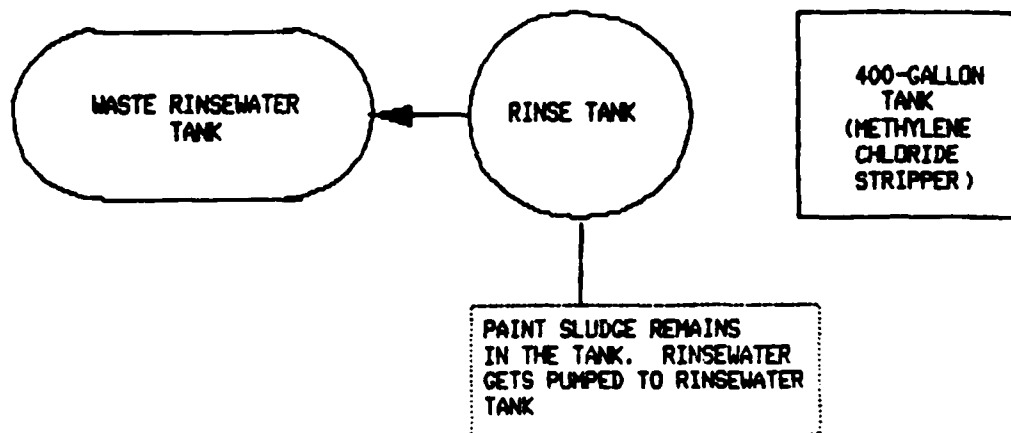


FIGURE 2. STRIPPING PROCESS FOR THE RCA MOUNT SHOP

10. RCA Sheet Metal Shop, Building 989
Contact: Mr Marshall, AV 854-2325

This facility is used to do chassis and rack work, refurbish antenna and paint antenna parts. Before painting, parts are sequentially placed in a caustic bath, rinsed in a nitric acid bath, and triple rinsed in an alodine (a dry chromic acid used to coat aluminum) solution for final preparation (See Figure 3). The rinsewater is currently going into the storm drain. However, in the near future the rinsewater should be piped to the sanitary sewer. The acid baths are cleaned out about twice a year and disposed of as hazardous waste.

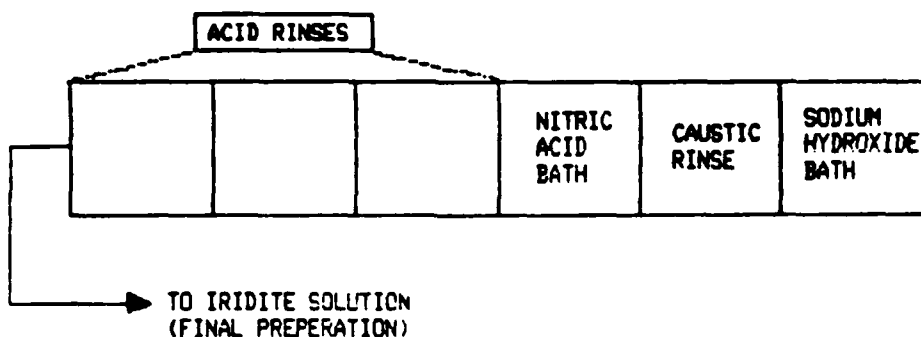


FIGURE 3. RCA SHEET METAL SHOP - METAL PROCESSING BATHS

The paint area consists of a waterfall paint booth. Every two weeks the water in the booth is pumped by personnel from the Plumbing Shop and disposed of in the sewer. Solid paint wastes are drummed and disposed of as hazardous waste.

11. TECOM Vehicle Paint Shop, Building 511
Contact: Mr Ross, AV 854-7630

This facility, consisting of 12 bays, is primarily used for painting government vehicles. The major types of chemicals used in this shop are: lacquer, enamel and small quantities of polyurethane paints, solvents and paint thinners. All wastes are currently placed in 55-gallon drums and disposed of as hazardous waste.

12. TECOM Transportation Hangar (Vehicle Maintenance Shop),
Building 312
Contact: Mr Stephens, AV 854-4213

Personnel in this shop are responsible for vehicle maintenance. Maintenance may range from engine overhauls to oil changes. Waste oils are placed in a 600-gallon underground tank while water containing small amounts of oils from floor cleaning is collected in a 1000-gallon underground tank (See Figure 4). The waste oils in the 600-gallon tank are sampled before being pumped out and taken to Complex 15 at CCAFS for oil recovery. The content of the 1000-gallon tank is also sampled before being pumped out and taken to Complex 15 at CCAFS.

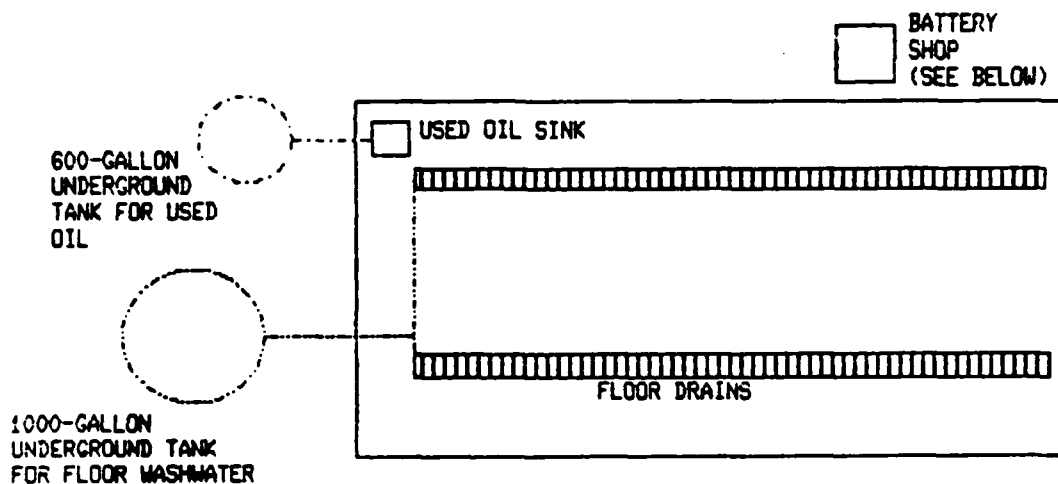


FIGURE 4. PATRICK AFB VEHICLE MAINTENANCE SHOP

The shop has a work order to build a drainage area to empty truck radiators containing water and antifreeze (ethylene glycol) behind this building. The water drained from radiators will enter a drain which will be connected to Patrick AFB's sewer system.

Adjacent to this building is the battery shop, where all batteries are serviced. Battery acid is currently being drummed and sampled prior to disposal as hazardous waste. There is an existing limestone neutralization tank (see Figure 5) which will be operational as soon as authorization for elementary neutralization of battery acid is given by the Florida Department of Environmental Regulation (DER).

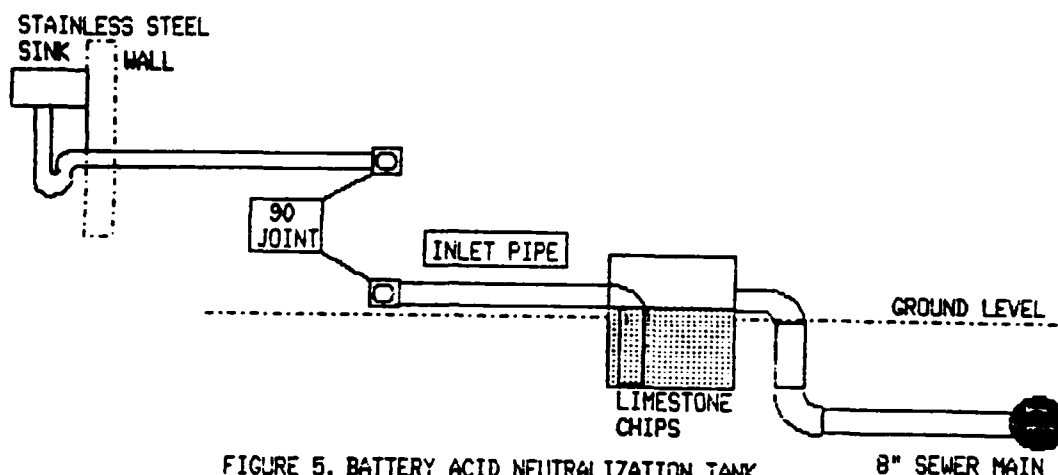


FIGURE 5. BATTERY ACID NEUTRALIZATION TANK
PATRICK AFB

B. Cape Canaveral AFS

1. Air Conditioning Maintenance, Hangar R.
Contact: Mr Bursey, AV 467-9122

This shop repairs and maintains all air conditioning (AC) units for Cape Canaveral AFS. Used oil from these AC units is the only waste generated in this shop. This used oil is sampled and usually disposed of as nonhazardous waste. Occasionally, when the used oil contains greater than 0.1 ppm total halogenated hydrocarbons, the oil is disposed of as hazardous waste.

2. Air Force South Complex (Wharf Area), Building 1069
Contacts: Mr Lowther and Mr Pennington, AV 467-9371

This complex is responsible for the loading and unloading of ships coming into Port Canaveral. Wastes generated from this complex consist of hydraulic oils, antifreeze and some paint wastes. Waste oils are from three cranes operating at the complex. The 25-ton and 45-ton cranes each contain about 25 gallons of hydraulic fluid and, the 120-ton crane contains about 35 gallons of hydraulic fluid. All wastes are drummed and picked up by Wiltech for disposal.

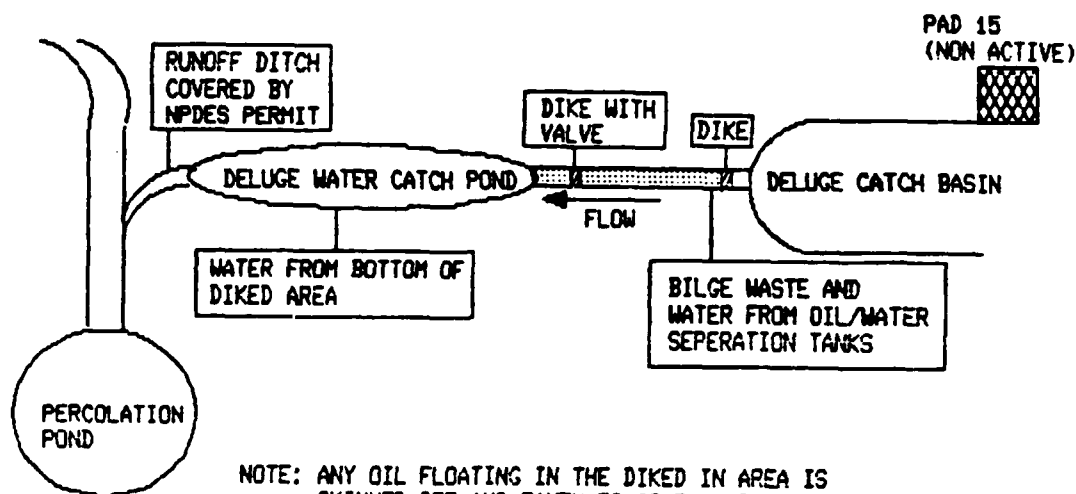


FIGURE 7. COMPLEX 15

At Complex 15 the water is placed in a diked area where any remaining oil is allowed to separate out, skimmed, and returned to the north tank at Complex 34. The water in the diked area is then released into the deluge water catch pond which discharges into a percolation pond via a flood control trench. The catch pond discharge is regulated by a National Pollutant Discharge Elimination System (NPDES) permit and is sampled by EG&G.

8. Physical Standard Lab (PMEL), Building 1724
Contact: Mr Remcose, AV 467-9412

This shop is responsible for calibration of instrumentation used on CCAFS. PMEL is broken into different areas and includes: Demonstration Standards, Quality Control, Temperature and Humidity, Sound and Vibration, Vacuum and Time, Flow, and Pressure Instrumentation.

Previously this shop distilled mercury for reuse but now mercury is sent to Bethlehem Steel, Bethlehem PA, for distillation. The only waste generated at this shop is primarily solid mercury wastes. This includes: mercury batteries, broken thermometers, oils containing mercury, used or broken mercury vapor lights. These wastes are wrapped, sealed in plastic, and then placed in a 55-gallon drum. Only about half a drum of mercury waste has been accumulated over an extended period so CCAFS has no current plan for disposal of mercury waste.

9. RCA Printed Circuit Board Shop, Hangar R&D, Building 1708
Contact: Mr Jones, AV 467-5987

This shop produces printed circuit boards used in telemetry, radar, data transfer and communications. Ammonium hydroxide is used as an etcher in an etching machine. The etching machine holds about 70 gallons of ammonium hydroxide and, when the etcher becomes weak and needs replenishing some of the used etcher is pumped into a 55-gallon drum for disposal. If the etcher becomes contaminated, all the etcher is removed and placed in a 55-gallon drum. All waste etcher (about four 55-gallon drums annually) is taken to the sewage treatment plant and trickled into the sewage treatment system. This shop is going to be relocated within the next two years.

10. Sandblast Yard and Painting Area
Contacts: Mr Jenkins, AV 467-4808; Mr Scott, AV 467-2508

Corrosion control is accomplished in these areas. The major wastes generated here are paint wastes which include: xylene, mineral spirits, MEK, dope, thinners and paints (epoxy, enamel, polyurethane), along with various hardeners. Paint cans are being dried and taken to the CCAFS landfill and thinners are being reused for brush cleaning. All other paint wastes are placed in 55-gallon drums and disposed of as hazardous waste. The sampling requirement for paint wastes from this facility are two shipments per year. Each shipment consists of approximately 10 55-gallon drums of paint wastes.

The sandblast yard has a hazardous waste storage facility for all paint wastes generated from six satellite stations: the sandblast yard, the paint area for the south end of the cape (Building 31332), the NASA industrial area, and the waste paint storage areas of Complex 40, Complex 36, and the Vertical Integration Building (VIB).

11. Vehicle Maintenance Paint Shop, Building 49536
Contact: Mr Bandy, AV 467-5231

Personnel in this shop are responsible for painting all vehicles on CCAFS. This shop has a waterfall paint booth and uses a chemical, B&B K-Booth, about four pounds, in the waterfall reservoir to coagulate the solid paint wastes to ease clean out and reduce hazardous waste. All paint wastes are placed in 55-gallon drums for disposal as hazardous waste. The 400 gallons of water are pumped out monthly by the Plumbing Shop personnel and apparently disposed of in the sewer system.

12. Vertical Integration Building (VIB), Acid Stripping and Clean Room
Contact: Mr Collons, AV 853-9295/3756; Mr Barrickman, AV 467-5037

The VIB is where the Titan III rocket (excluding the two side solid boosters) is assembled. Inside the VIB is an acid stripping room and a clean room. Ground equipment is first sent through the stripping room for bulk cleaning before being sent to the clean room. Personnel in the acid stripping room use a variety of acids (nitric, Nitric Nitrad, nitric sodium

dichromate, Nitric Amchem 17, and Isoprep Alkaline 177) to accomplish their tasks. The acid baths are sampled every three months; and, if weak or contaminated, the acids are pumped out, drummed and disposed of as hazardous waste. The chemicals used in the clean room are all nonhazardous.

C. Summary of General Waste Disposal Practices at PAFB and CCAFS

1. Alodine from the RCA Sheet Metal Shop is being placed in 55-gallon drums and disposed of as hazardous waste due to high chromium levels.

2. Antifreeze is stored in 55-gallon drums and sent to CCAFS for disposal as nonhazardous waste. Currently, TECOM (located at PAFB) has a work order in to build a radiator drainage area behind Building 312. This drainage area will be connected directly into the sewer system of PAFB.

3. Battery acid is placed in 55-gallon drums, sampled for heavy metals, e.g., cadmium, chromium, lead, and disposed of as hazardous waste due to corrosivity (pH less than or equal to 2). In the near future, if PAFB gets approval from Florida DER, the neutralization tank already installed behind the vehicle maintenance area (Building 312) will become operational. In addition, CCAFS will proceed to install its neutralization tank.

4. Uncontaminated fuels from aircrafts are sent to 549 CAM's AGE, Building 691, where it is filtered twice and reused in ground equipment. Contaminated fuels are taken to the fire training area at PAFB and used in the fire training pit.

5. Paint wastes are placed in 55-gallon drums and disposed of as hazardous waste because of the ignitability (less than 140 degrees Fahrenheit) of the solvents and thinners used in painting.

6. PD-680, Type II, is mixed with uncontaminated used oils and sent to the heating plant at CCAFS as fuel.

7. All processes using silver have recovery units to reclaim the silver.

8. Synthetic oils are turned over to DRMO for resale.

9. Used oils, other than synthetic oil, from vehicles, machines or aircrafts are either reused as fuel at the CCAFS's heating plant if uncontaminated or sent to a hazardous waste incinerator if contaminated.

10. Mercury wastes are being accumulated until the quantity warrants disposal.

11. Lithium batteries (about one to two dozen per year) from the Inertia Upper Stage, Hangar E, are sent back to the manufacturer, Delco, in California. An exemption is required from the Department of Transportation before shipment of these batteries.

12. Cutting oil is used up in the process.

13. Hydrazine wastes (diluted to 2% hydrazine) are disposed of by contract.

V. OBSERVATIONS AND CONCLUSIONS

A. The hazardous waste program is well managed and is effective. The combined efforts of Air Force, NASA, and contractor personnel have resulted in a comprehensive program to manage and minimize hazardous waste.

B. Most shop personnel were knowledgeable about how hazardous waste is managed. The recently developed education and training program is obviously paying-off.

C. The hazardous waste analysis plan was developed to reduce the cost of sampling and analysis. The plan outlines the waste characteristics of each waste stream, frequency of analysis, and parameters for analysis. This is the best hazardous waste analysis plan the survey team has seen thus far.

D. All hazardous waste analyses are performed by the Air Force Energy Management Laboratory at CCAFS.

E. In reviewing several waste analysis laboratory profile forms, KSC Form 26, we noticed the chemists frequently used "high" for results of total organic chlorine. However, "high" is not defined, e.g., a specific concentration range or greater than a specific concentration, in any written document.

F. The Air Force Energy Management Laboratory has a mass spectrometer (MS) that has never been used because of continual operational problems. So far, the lack of a MS has not affected the laboratory's capability to perform hazardous waste analysis. That is, there has been no need to perform analysis on pesticides and herbicides as part of the extraction procedure or EP toxicity test. However, EPA is currently proposing to expand its EP toxicity test to include as many as 38 additional chemicals; and, many of these chemicals are organics that will require the use of an MS for analysis. When the new toxicity test is promulgated, the Air Force Energy Laboratory will either need to use the USAFOEHL or a contract laboratory to satisfy the additional toxicity test requirement, or obtain a service contract to ensure their MS is operational.

G. The 6550 ABG/DEEV plans to procure solvent recovery units for both PAFB and CCAFS. Judging from the quantities of paint and solvent wastes generated at CCAFS, a solvent recovery unit is probably feasible in the long-run. However, a centrally located solvent recovery unit at PAFB may not be feasible based on the intermittent generation and small quantities of paint and solvent wastes. Perhaps, a small portable type of solvent recovery unit may be more practicable and manageable.

H. Several accumulation point managers did not know whether their wastes are hazardous or nonhazardous. Some asked why is there a need to segregate wastes when the contractor eventually mixes certain wastes during pick-up.

I. OPLAN 19-14, Petroleum Products and Hazardous Waste Management Plan, states that a coliwasa will be used to sample containerized liquid wastes. However, discussion with EG&G reveals that Wiltech has been using a stainless steel siphon tube and probe (see Figure 8) instead. EG&G claims that the coliwasa presents some safety hazards during the transfer of the waste from the coliwasa and the sample container. Also, EG&G claims that the siphon tube and probe are equivalent to the coliwasa.

J. Wiltech sampling technicians are required to be certified by taking technical courses, undergo on-the-job training with a certified sampling technician and pass written and performance examinations.

K. The disposal of battery acids at PAFB appears inconsistent, i.e., the 549 CAM Battery Shop is neutralizing their acids while the Vehicle Maintenance Battery Shop is not.

VI. RECOMMENDATIONS

A. Management Practices

1. On 27 Aug 86, Florida promulgated its laboratory certification program for hazardous waste. The Air Force Energy Management Laboratory should try to get certified under this voluntary program which involves an initial application, an annual fee, and an on-site visit by the State of Florida, Department of Health and Rehabilitative Service. Obtaining certification will establish creditability to the hazardous waste analyses and could be important if PAFB or CCAFS should ever be involved in litigation. Information on certification can be obtained by contacting Dr Howard R. Rarick, P.H., M.P.H., Biological Administrator, Environmental Program at (904) 359-6456.

2. Although EPA SW-846, Test Methods for Evaluating Solid Wastes, is referenced in OPLAN 19-14, Petroleum Products and Hazardous Waste Management Plan, the actual procedures used by the Air Force Energy Management Laboratory including an explanation of results, if necessary, e.g., "high", should be documented in laboratory standard operating procedures. This would ensure consistency among the chemists and allow current and future hazardous waste managers to have a reference for understanding how waste analyses are performed and for understanding the results.

3. The Air Force Energy Management Laboratory is unable to perform a "complete" EP toxicity test because their mass spectrometer is inoperable. Currently, this is not a problem; however, the laboratory should proceed to expand their capability by procuring a service contract for the mass spectrometer in anticipation of future requirements.

4. Currently, each drum of used oil is sampled for possible total halogenated hydrocarbons. Historically, few drums are identified as contaminated; therefore, significant cost reduction may be achieved by random sampling of a "statistically significant" number of drums. This will cut the cost of both sampling and analysis.

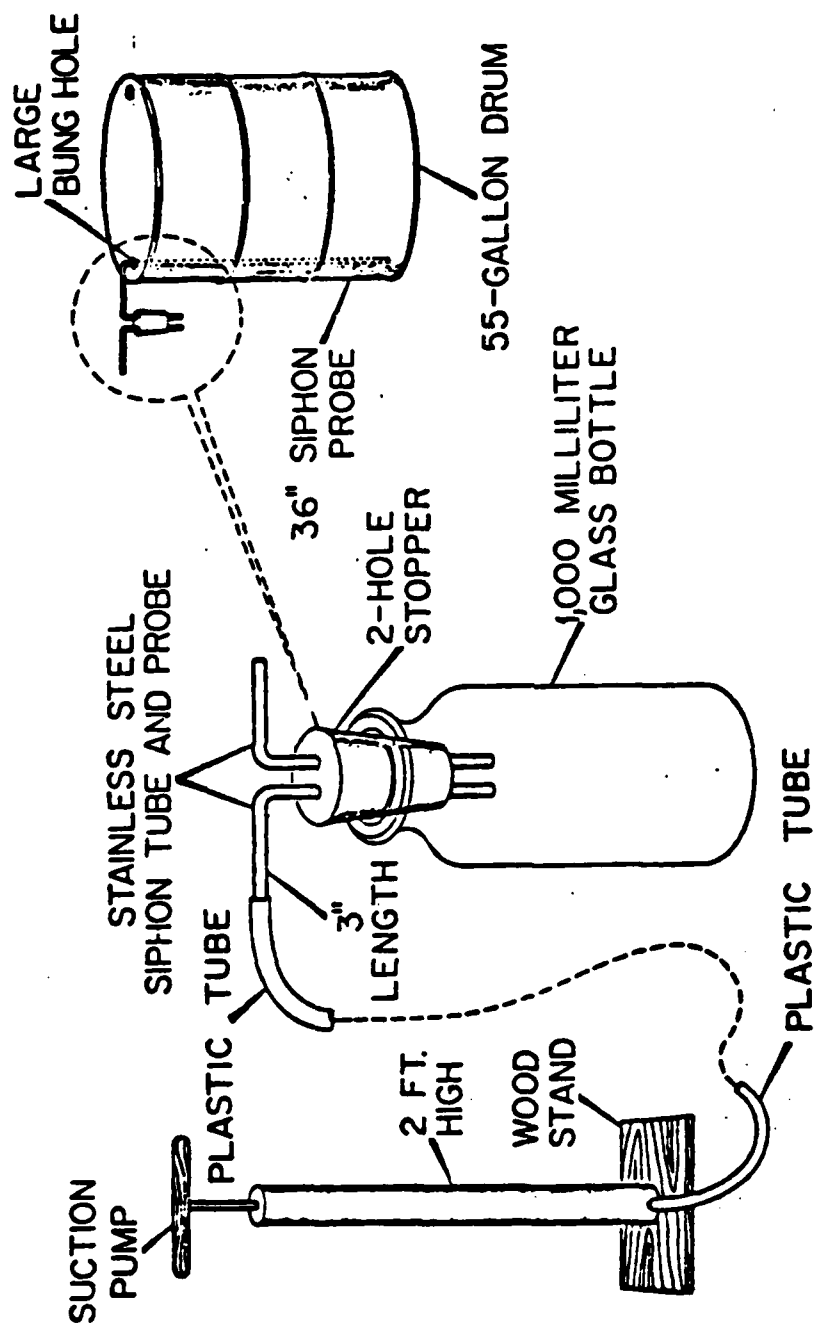


FIGURE 8.
DRUM SAMPLING ASSEMBLY

5. The education and training program should focus on clarifying any questions from accumulation point managers. Providing answers will help maintain not only an informative but supportive group of managers.

6. A way to resolve whether the coliwasa and the stainless steel siphon tube are equivalent is to compare the analytical results of a series of waste samples taken by both sampling methods.

7. The Air Force Energy Laboratory should serve as the central repository for maintaining the waste analyses results indefinitely.

8. The wastewater from the waterfall paint booth at CCAFS's Vehicle Maintenance Paint Shop should be sampled to confirm that it is nonhazardous.

B. Waste Minimization

1. Ideally, when a solvent recovery unit is procured for CCAFS, the unit should be located at the sandblast yard and painting area where large quantities of paint and solvent wastes are generated and supervisory personnel have a positive attitude toward hazardous waste management. In any event, the key to a successful solvent recovery program will be strict segregation along with strong management.

2. The most promising way to reduce the methylene chloride waste stream at the RCA Mount Shop is to do the majority of the work by dry media blasting, i.e., walnut shells. Personnel at the shop said the majority of their work can be accomplished using walnut shell blasting and are enthusiastic about the possibility of reducing the use of a chemical stripper. Depending on sample results, other ways to reduce this waste stream include prolonging the dripping phase of the operation and possibly recycling the rinsewater for the initial rinse.

3. If battery acid neutralization at PAFB is approved, a "T" fitting should be placed on the neutralization tank. This will ease both the checking of the pH of the neutralized acid and the periodic sampling of the effluent for heavy metals.

4. Aquanetics Inc., makes oil recycling units such as the PHORS 180A/300A. These units use vacuum distillation, ultrafiltration to remove water and particles from any of the oils listed below:

Hydraulic	Castor	Compressor	Refrigeration
Turbine	Quench	Circulation	Vacuum pump
Gear	Heat Transfer	Transmission	Machine
Cutting	Transformer	Synthetic diesters	
Synthetic phosphate esters			

These systems however, do not work on oils that lose viscosity (break down) at high temperatures, such as motor oils. Consequently, Aquanetics mails the requester a questionnaire (Appendix D) to see what types of oils are used in the facility. From this questionnaire, Aquanetics can evaluate what oils are or are not recyclable and the size of the unit necessary.

Currently, both PAFB and CCAFS use hydraulic, gear, cutting and refrigeration oils, totaling approximately 2596 gal/yr (Appendix C), as fuels in their heating plants. This disposal method is the simplest and most economical at the current time. Should state or federal regulations change in the future (e.g. listing oils as a hazardous waste) these types of units may be a viable method for minimizing the amounts of oils disposed of at both PAFB and CCAFS.

3. Complex 40, Titan Launch Pad
Contact: Mr Swope, AV 467-6996/6997

Titan III missiles are launched at this complex. The only wastes generated here consist of used oils from the elevators and cranes servicing this pad.

4. Hanger U, Vehicle Maintenance, Building 1744
Contact: Mr Lenard, AV 467-5231

Personnel in this shop are responsible for vehicle maintenance. Wastes from this shop include: oils, ethylene glycol, brake fluid, battery acids and diesel fuel. Currently, brake fluid and ethylene glycol are drummed together, battery acid is drummed separately, while waste oil is placed in a 25,000-gallon tank. Upon approval of the battery neutralization tank at PAFB, CCAFS will also install a battery neutralization tank similar to the one at PAFB (Figure 5).

5. Missile Inert Storage (MIS), Building 75251
Contact: Mr New, AV 467-6758

United Technologies operates this storage facility for Titan missile parts. Personnel use 1,1,1-trichloroethane to wipe grease off parts in preparation for storage and (or) use. Wastes include rags contaminated with 1,1,1-trichloroethane and grease, oils, potassium hydroxide (vials of 10 cc, 16 cc and 128 cc) used to service the batteries of the Titan III missile, and some printer toner and dispersant used in the copy machine. Waste potassium hydroxide is being stored (about one quart). Waste toner and dispersant are changed every 90 days and stored in a 55-gallon drum before being used as fuel in the heating plant.

6. Naval Ordnance Test Unit (NOTU), Trident Wharf
Contact: Mr Jackson, AV 467-2917

This facility is responsible for the support and maintenance of submarines. The major waste from this facility is bilge water, a combination of water and residual oil from the bottom of submarines. Other wastes from this facility are listed in Table 3. The quantities of these wastes will vary depending on the type, origin and tour of the submarines.

Wastes are contained in 55-gallon drums when taken off the submarines. Afterward, the wastes are taken and placed in the storage facility near the wharf in either the receiving, nonhazardous or hazardous area. Past problems with unidentified waste drums have been resolved by improved management.

TABLE 3
WASTES GENERATED BY NOTU

1. Ammonium Hydroxide
2. Bilge Wastes (Waste Bilge Water)
3. Ethyleneliaminetetra acid (EDTA) plus Citric Acid
4. Gasoline
5. Lithium Hydroxide Canisters
6. Mercuric Nitrate Solution
7. Mercury Vapor Lamp
8. Missile Tube Waste (Waste sea water)
9. Monoethanolamine from CO₂ Scrubber
10. Nicad Battery Electrolyte
(Waste Potassium Hydroxide Solution)
11. SBA Candles Canisters
12. Sodium Chromate
13. Waste Diesel Fuel
14. Waste Lube Oil
15. Waste Paints

7. Oil Recovery Areas
Contact: Mr Thomas, (305) 867-2518

These areas are located at Complexes 34 (Figure 6) and 15 (Figure 7). Complex 34 consists of two 28,000-gallon tanks (north and south) which are connected to each other. Waste oils and any mixtures of oil and water are initially placed in the north tank. Once the oil and water are separated, the oil is filtered and placed into the south tank where it is picked up and taken to the heating plant on base for burning. The water is drawn off the bottom of the north tank and taken to Complex 15 by tank truck.

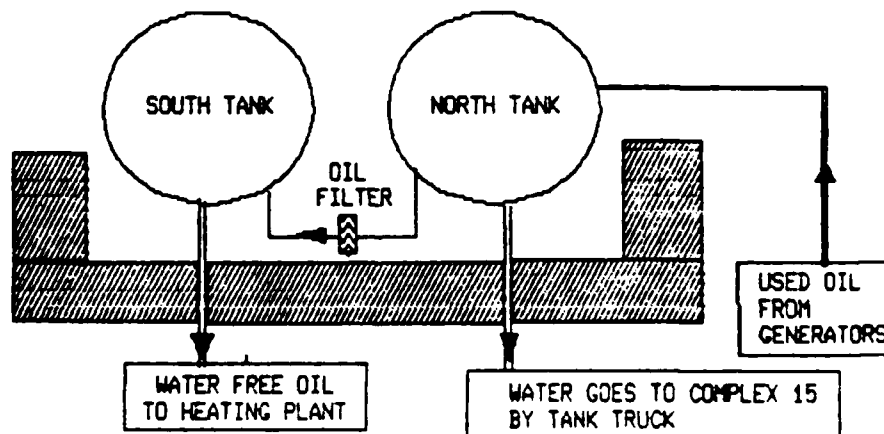


FIGURE 6. OIL WATER SEPARATION TANKS AT COMPLEX 34

REFERENCES

1. Aspen System Corporation, Rockville, Maryland, "EPA Proposes New Toxicity Test, Names 38 New Chemicals for Testing", Hazardous Waste Report, Vol 7, No 21, 23 June 86.
2. Department of The Navy Memorandum, "NOTU Hazardous Waste (HW) Process Codes", From: SPP021, Safety Manager, To: SPP421, Dockmaster, 10 Jan 86.
3. Headquarters Eastern Space and Missile Center, United States Air Force Patrick Air Force Base, Florida, Environmental Protection, Draft OPLAN 19-14, "Petroleum Products and Hazardous Waste Management Plan", 30 Apr 86.
4. Kennedy Space Center (KSC) Sampling Procedures Manual, Appendix 8.3, Technical Procedures, No. 4-0-108, "Drum Sampling of Solvents or Liquids For Particle Count and Purity Analysis Using a Bottle", KSC and CKAFS.
5. The Bureau of National Affairs, Inc., "Oil reclaimed Is Money Saved", Chemical Substances Control, No 151, 3 Jul 86.
6. United States Environmental Protection Agency, "Identification and Listing of Hazardous Waste", 40 CFR 261.

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APPENDIX A
Request Letters

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APPENDIX A



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE SYSTEMS COMMAND
ANDREWS AIR FORCE BASE DC 20334-5000

5 MAY 1986

REPLY TO
ATTN OF

DENV

SUBJECT

Hazardous Waste Staff Assistance

SGPB

SGPB

1. You are aware of my discussions with Lt Col Marlin Sweigart and Maj Elliot Ng, OEHL/ECQ, concerning the possibility of their accomplishing a hazardous waste consultant survey of Patrick AFB and Cape Canaveral AFS early this summer. As our POC for OEHL support please arrange for this survey.
2. The survey should address our hazardous waste management practices at Patrick AFB and Cape Canaveral AFS as well as exploring opportunities for hazardous waste minimization. As we anticipate eventually contracting for hazardous waste minimization studies at our bases, a review of our draft SOW (Atch 1) in the OEHL/ECQ survey report, would be appreciated.
3. The general survey scope discussed by Maj Ng on 23 Apr 86 at the BEE Symposium (Atch 2) is a satisfactory guide line for this survey. Our POC at Patrick AFB/CCAFA is Mr Warren Bradford, 6550 ABG/DEEV, AUTOVON 854-7288. ECQ should contact Warren directly in arranging for their visit.

Frank P. Gallagher III

FRANK P. GALLAGHER III, Lt Col, USAF, BSC
Chief of Environmental Planning
DCS/Engineering & Services

2 Atch

1. Draft SOW
2. BEE Symposium Paper

cc: 6550 ABG/DEEV

1st Ind, HQ AFSC/SGPB

9 May 96

TO: USAF OEHL/CC

Request you accomplish the hazardous waste consultant survey and review the draft SOW for a waste minimization study outlined in paragraph 1 and 2 of Lt Col Gallagher's letter.

Marlan G. Humrickhouse

MARLAN G. HUMERICKHOUSE, Colonel, USAF, BSC
Command Bioenvironmental Engineer
Directorate of Health & Environment

2 Atch
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APPENDIX B
Wastes Generated

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Table B-1
WASTES GENERATED AT PATRICK AFB

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
Det 15, 38 ARRS	Ramp 985	JP-4	100
549 TASTG	691	Fuels (JP, AVGAS)	3,600
2 CISC	630	MoGas	200
6550 Transportation	312W	Fuels (DF2 & MoGas)	550
Mr Decker	1350	Fuel	110
2 CISC	630	Fuels-Diesel	450
Det 5, 9 SSR	Ramp 985	JPTS	300
Mr Gilbert	676	Fuel, Oil, Water	20,000
Det 15, 38 ARRS	Ramp 985	Hydraulic Oil-Mineral	100
6550/DEMMA	523	Refrigerant Oil	1,000
6550 Transportation	312W	Hydraulic Oil-Mineral	495
Det 5, 9 SSR	Ramp 985	Hydraulic Oil-Mineral	55
549 TASTG	691	Hydraulic Oil-Mineral	200
549 TASTG	691	Synthetic Oil	350
Det 5, 9 SSR	Ramp 985	Synthetic Oil	50
Det 15, 38 ARRS	Ramp 985	Synthetic Oil-23699C	200
Det 15, 38 ARRS	Ramp 985	Synthetic Oil-7808J	300
Mr Smith	681	Latex Paint Wastes	220
549 TASTG	691	Solvent-MEK, Paint Wastes	500
Mr Smith	681	Paint Wastes & Solvents	220
549 TASTG	691	Solvent-F004, F002	400
Det 15, 38 ARRS	Ramp 985	PD-680	0
2 CISC	630	PD-680	50
2 CISC	630	Paint Wastes & Solvents	50
6550 Transportation	312W	Solvents-F003 & F005	110
Det 5, 9 SSR	Ramp 985	Paint Wastes	50
6550 Transportation	312W	Paint Wastes	220
RCA	989	Iridite Solution	500
RCA	989	Caustic Solution	500
AFTAC	989	Photo, Silver	280
6550 Print Shop	318	Photo, Silver	120
549 TASTG	691	Photo, Silver	50
ECMC Hospital	1380	Photo, Silver	800
6550 Photo Lab	710	Photo, Silver	50
549 TASTG	691	Alodine	100
Auto Hobby Shop	331	Lube Oil-Mineral	3,000
RCA	691	Antenna Gear Box Oil	400
549 TASTG	691	Lube Oil-Mineral	1,500
BX Service Station	733	Lube Oil-Mineral	6,000
2 CISC	630	Lube Oil-Mineral	1,150
Mr Decker	1350	Lube Oil-Mineral	440
Mr Decker	1350	Oil, Water, Eth. Glycol	100
6550 Transportation	312W	Lube Oil-Mineral	2,000
6550 CE	958S	Lube Oil-Mineral	550
Mr Decker	1350	Acid	120
6550 Transportation	312W	Acid	660
RCA	989	Nitric Acid Solution	500
RCA	691	Paint Stripper Rinsewater	3,000
		Total:	51,700

Table B-2
WASTES GENERATED BY CAPE CANAVERAL AFS

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
PAA Phys	1724	JP-4, MoGas, Hyd Oil;lab	12
PAA LC-40	47100	Fuel/Water mix	350
PAA	Fac 70528	Petroleum	110
PAA A/C	Hgr R	Used Lube Oil	880
PAA Water	40906	Used Lube Oil	1,250
Energy Manag Lab	1726	Waste Lube Oil	660
CSD MIS	75251	Gear Oil	5
PAA Gen Shop	44633E	Used Lube Oil	2,400
PAA H. Equip	UGT @ Fac 49835	Used Lube Oil	1,600
PAA Maint Shops	Fac 70512	Used Lube Oil	700
Lockheed Missile	Hgr Y	Hydraulic Oil	100
PAA Maint Shop	92017	Used Lube Oil	250
PAA Maint Shops	CX17, Fac 1270	Used Lube Oil	200
MMC	VIB	Gear Oil 90W	130
PAA Maint Shop	00006	Used Lube Oil	160
MMC	VIB	Locomotive Lube Oil	330
CSD MIS	75251	Vacuum Pump Oil	1
MCC	7065	Lube Oil/Water Mixtures	55
PAA Port	Shop Fac 1069W	Waste Lube Oil	320
CSD MIS	75251	Hydraulic Oil	1
PAA Mach Shop	1708	Waste Lube Oil	110
PAA Veh	UG Tank 54813	Used Lube Oil	2,000
Lockheed Missile	Hgr Y	Lube Oil	400
NOTU	Trident Wharf	Lube Oil-Mineral	275
MMC	MAB-1	Oil-Water Mixture	55
PAA Mach Shop	1708	Degreasing Solvent	110
Lockheed Missile	Hgr Y	Solvents, Grease	50
PAA Maint Shops	CX17, Fac 1270	Paints, Solvents	250
MMC	MAB-1	Mixed Solvents	55
PAA Maint Shop	92017	Paints, Solvents	375
MMC	VIB	Waste Solvents Mixture	1,100
NOTU	Trident Wharf	Paints	165
PAA Veh	Fac 54813	Paint Wastes	200
PA Maint Shop	00006	Paints, Solvents	110
PAA Ind	Fac 44621	Paints, Solvents	3,300
Energy Manag Lab	1726	Solvents	330
RCA Fac 1641	1641	Cleaning Solvent	60
CSD MIS	75251	Trichloroethane	220
BAC	Hgr E	Vacuum Pump Oil/Hydrazine	1
BAC	Hgr E	Hydrazine & Water	1,000
MDTSCO SPIF	70000	Water/hydrazine	2,000
MDTSCO SPIF	70000	Water/N2O4	6,000

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
MDTSCO SPIF	70000	Water/MMH propellant	13,000
BAC	Hgr E	Battery Electrolyte KOH	8
NOTU	Trident Wharf	Caustics (KOH)	110
MMC	VIB	Caustic (KOH)	1
NOTU	Trident Wharf	Lithium Hydroxide	330
CSD MIS	75251	Caustic (KOH)	2
RCA Cir Brd Shop	Fac 1638	C.B. Etcher	375
RCA Cir Brd Shop	Fac 1638	C.B. Leveling Oil-NOS	55
PAA Mach Shop	Hgr D East	Alodine Solution	200
NOTU	Trident Wharf	Alodine	55
PAA Mach Shop	1708	Used Cutting Oils	110
PAA Elec Shop	Fac 55118	Used Trans. Oil (<50 ppm)	800
PAA Veh	Fac 54813	Used Brake Fluid	50
PAA Veh	Fac 54813	Used Antifreeze	500
PAA Water	UG Tanks	DF-2, Oil	4,280
NOTU	Trident Wharf	Monoethanol Amine	165
NOTU	Trident Wharf	Halogenated HC	50
NOTU	Trident Wharf	Solids (BBA Candles)	220
NOTU	Trident Wharf	Missile Tube Waste	1,155
NOTU	Trident Wharf	Mercuric Nitrate	110
NOTU	Trident Wharf	Bilge wastes	250,000
PAA Veh	Fac 54813	Battery Acid	495
PAA Maint Shops	Fac 70512	Battery Acid	5
CSD MIS	75251	Versatec Toner Waste	600
MMC	VIB	Nitric/Nitradd	53
CSD MIS	75251	Freon TF	55
MMC	VIB	ISOPREP #177	75
		TOTAL:	300,539

Table B-3
WASTE CATEGORIES FOR PATRICK AFB

CATEGORY 2

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
Det 15, 38 ARRS	Ramp 985	Hydraulic Oil-Mineral	100
6550/DEMMA	523	Refrigerent Oil	1000
RCA	691	Antenna Gear Box Oil	400
Auto Hobby Shop	331	Lube Oil-Mineral	3,000
Mr Decker	1350	Oil, Water, Eth. Glycol	100
6550 Transportation	312W	Lube Oil-Mineral	2000
2 CISC	630	Lube Oil-Mineral	1,150
Mr Decker	1350	Lube Oil-Mineral	440
6550 Transportation	312W	Hydraulic Oil-Mineral	495
6550 CE	958S	Lube Oil-Mineral	550
Det 5, 9 SSR	Ramp 985	Hydraulic Oil-Mineral	55
BX Service Station	733	Lube Oil-Mineral	6,000
549 TASTG	691	Hydraulic Oil-Mineral	200
549 TASTG	691	Lube Oil-Mineral	1,500
		TOTAL:	16,990

CATEGORY 3

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
DET 15, 38 ARRS	RAMP 985	JP-4	100
549 TASTG	691	FUELS (JP, AVGAS)	3,600
6550 Transportation	312W	Fuels (DF2 & MoGas)	550
Mr Decker	1350	Fuel	110
2 CISC	630	Fuels-Diesel	450
Det 5, 9 SSR	Ramp 985	JPTS	300
Mr Gilbert	676	Fuel, Oil, Water	20,000
		TOTAL:	25,310

CATEGORY 5

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
Mr Smith	681	Latex Paint Wastes	220
549 TASTG	691	Solvent-MEK, Paint Wastes	500
Mr Smith	681	Paint Wastes & Solvents	220
549 TASTG	691	Solvent-F004, F002	400
Det 15, 38 ARRS	Ramp 985	PD-680	0
2 CISC	630	PD-680	50
2 CISC	630	Paint Wastes & Solvents	50
6550 Transportation	312W	Solvents-F003 & F005	110
Det 5, 9 SSR	Ramp 985	Paint Wastes	50
6550 Transportation	312W	Paint Wastes	220
		TOTAL:	1,820

CATEGORY 7

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
RCA	691	Paint Stripper Rinsewater	3,000
		TOTAL:	3,000

CATEGORY 8

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
Mr Decker	1350	Acid	120
6550 Transportation	312W	Acid	660
RCA	989	Nitric Acid Solution	500
		TOTAL:	1,280

CATEGORY 11

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
AFTAC	989	Photo, Silver	280
6550 Print Shop	318	Photo, Silver	120
549 TASTG	691	Photo, Silver	50
ECMC Hospital	1380	Photo, Silver	800
6550 Photo Lab	710	Photo, Silver	50
		TOTAL:	1,300

CATEGORY 12

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
RCA	989	Caustic Solution	500
		TOTAL:	500

CATEGORY 13

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
549 TASTG	691	Synthetic Oil	350
Det 5, 9 SSR	Ramp 985	Synthetic Oil	50
Det 15, 38 ARRS	Ramp 985	Synthetic Oil-23699C	200
Det 15, 38 ARRS	Ramp 985	Synthetic Oil-7808J	300
		TOTAL:	900

CATEGORY 14

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
RCA	989	Iridite Solution	500
549 TASTG	691	Alodine	100
		TOTAL:	600

Table B-4
WASTE CATEGORIES FOR CAPE CANAVERAL AFS

CATEGORY 1

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
NOTU	Trident Wharf	Bilge wastes	250,000
		TOTAL:	250,000

CATEGORY 2

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
PAA H. Equip	UGT @ Fac 49835	Used Lube Oil	1,600
PAA Maint Shops	Fac 70512	Used Lube Oil	700
Lockheed Missile	Hgr Y	Hydraulic Oil	100
PAA A/C	Hgr R	Used Lube Oil	880
PAA Water	40906	Used Lube Oil	1,250
Energy Manag Lab	1726	Waste Lube Oil	660
PAA Port	Shop Fac 1069 W	Waste Lube Oil	320
CSD MIS	75251	Gear Oil	5
PAA Gen Shop	44633E	Used Lube Oil	2,400
MCC	7065	Lube Oil/Water Mixtures	55
CSD MIS	75251	Vacuum Pump Oil	1
PAA Maint Shop	92017	Used Lube Oil	250
PAA Maint Shops	CX17, Fac 1270	Used Lube Oil	200
MMC	VIB	Gear Oil 90W	130
Lockheed Missile	Hgr Y	Lube Oil	400
PAA Mach Shop	1708	Waste Lube Oil	110
CSD MIS	75251	Hydraulic Oil	1
MMC	VIB	Locomotive Lube Oil	330
PAA Maint Shop	00006	Used Lube Oil	160
PAA Veh	UG Tank 54813	Used Lube Oil	2,000
NOTU	Trident Wharf	Lube Oil-Mineral	275
MMC	MAB-1	Oil-Water Mixture	55
		TOTAL:	11,882

CATEGORY 3

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
PAA	Fac 70528	Petroleum	110
PAA LC-40	47100	Fuel/Water mix	350
PAA Phys	1724	JP-4, MoGas, Hyd Oil; Lab	12
PAA Water	Ug Tanks	DF-2, Oil	4,280
		TOTAL:	4,752

CATEGORY 4

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
MDTSCO SPIF	70000	Water/N2O4	6,000
MDTSCO SPIF	70000	Water/MMH propellant	13,000
		TOTAL:	19,000

CATEGORY 5

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
Lockheed Missile	Hgr Y	Solvents, Grease	50
PAA Maint Shop	00006	Paints, Solvents	110
PAA Maint Shops	CX17, Fac 1270	Paints, Solvents	250
MMC	MAB-1	Mixed Solvents	55
PAA Maint Shop	92017	Paints, Solvents	375
PAA Veh	Fac 54813	Paint Wastes	200
MMC	VIB	Waste Solvent Mixture	1,100
PAA Ind	Fac 44621	Paints, Solvents	3,300
PAA Mach Shop	1708	Degreasing Solvent	110
CSD MIS	75251	Trichloroethane	220
Energy Manag Lab	1726	Solvents	330
NOTU	Trident Wharf	Paints	165
RCA Fac 1641	1641	Cleaning Solvent	60
		TOTAL:	6,325

CATEGORY 6

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
BAC	Hgr E	Vacuum Pump Oil/ Hydrazine	1
MDTSCO SPIF	70000	Water/hydrazine	2,000
BAC	Hgr E	Hydrazine & water	1,000
		TOTAL:	3,001

CATEGORY 8

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
PAA Maint Shops	Fac 70512	Battery Acid	5
PAA Veh	Fac 54813	Battery Acid	495
MMC	VIB	Nitric/Nitradd	53
MMC	VIB	ISOPREP #177	75
		TOTAL:	628

CATEGORY 9

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
NOTU	Trident Wharf	Monoethanol Amine	165
NOTU	Trident Wharf	Missile Tube Waste	1,155
NOTU	Trident Wharf	Halogenated HC	50
NOTU	Trident Wharf	Solids (BBA Candles)	220
NOTU	Trident Wharf	Mercuric Nitrate	110
		TOTAL:	1,700

CATEGORY 10

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
PAA Veh	Fac 54813	Used Brake Fluid	50
PAA Elec Shop	Fac 55118	Used Trans. Oil	800
		(<50 ppm)	
PAA Veh	Fac 54813	Used Antifreeze	500
		TOTAL:	1,350

CATEGORY 12

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
MMC	VIB	Caustic (KOH)	1
NOTU	Trident Wharf	Lithium Hydroxide	330
CSD MIS	75251	Caustic (KOH)	2
NOTU	Trident Wharf	Caustic (KOH)	110
BAC	Hgr E	Battery Electrolyte KOH	8
		TOTAL:	451

CATEGORY 14

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
PAA Mach Shop	Hgr D East	Alodine Solution	200
NOTU	Trident Wharf	Alodine	55
		TOTAL:	255

CATEGORY 15

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
CSD MIS	75251	Versatec Toner Waste	600
CSD MIS	75251	Freon TF	55
		TOTAL:	655

CATEGORY 16

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
RCA Cir Brd Shop	Fac 1638	C.B. Leveling Oil-NOS	55
RCA Cir Brd Shop	Fac 1638	C.B. Etcher	375
		TOTAL:	430

CATEGORY 17

ACTIVITY	COLLECTION POINT	PRODUCT	QTY/GALLONS
PAA Mach Shop	1708	Used Cutting Oils	110
		TOTAL:	110

APPENDIX C
Oils that Might be Recyclable

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OILS THAT MIGHT BE RECYCLABLE

ACTIVITY PAFB	COLLECTION POINT	PRODUCT	QTY/GALLONS
Det 15, 38 ARRS	Ramp 985	Hydraulic Oil-Mineral	100
6550/DEMMA	523	Refrigerant Oil	1,000
6550 Transportation	312W	Hydraulic Oil-Mineral	495
Det 5, 9 SSR	Ramp 985	Hydraulic Oil-Mineral	55
549 TASTG	691	Hydraulic Oil-Mineral	200
RCA	691	Antenna Gear Box Oil	400
		Total from Patrick AFB:	2,250

ACTIVITY CCAFS	COLLECTION POINT	PRODUCT	QTY/GALLONS
Lockheed Missile	Hgr Y	Hydraulic Oil	100
CSD MIS	75251	Gear Oil	5
MMC	VIB	Gear Oil 90W	130
CSD MIS	75251	Hydraulic Oil	1
PAA Mach Shop	1708	Used Cutting Oils	110
		Total from Cape Canaveral AFS:	346
		Total of Both Cape Canaveral AFS and Patrick AFB:	2,596

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APPENDIX D
Questionnaire

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AQUANETICS, INC.

ON-SITE OIL RECLAMATION SYSTEMS

111 Milbar Blvd., Farmingdale, NY 11735

(516) 454-7600

U.S.A.

TELEX: 64 5149 MIMCO, FDLE



OIL RECLAMATION APPLICATION DATA SHEET

NOTE: If more than one type of oil is used, or more than one plant location exists, please fill out a data sheet for each type of oil and plant location.

COMPANY NAME: _____ DATE: _____

ADDRESS: _____ COMPANY CONTACT: _____

CITY: _____ TITLE: _____

COUNTRY: _____

TELEPHONE #: (_____) _____ TELEX: _____

1. TYPE OF INDUSTRY

Industrial Manufacturing ☐ Utilities ☐ Military ☐ Steel ☐
 Petro Chemical ☐ Plastics ☐ Mining ☐
 Automotive ☐ Refining ☐ Other (Please Specify) _____

2. HOW MANY OPERATING SHIFTS DAILY? One ☐ Two ☐ Three ☐

3. TYPE OF OIL

	VISCOSITY			
	at 100°F	at 210°F	at 45°C	at 100°C
Hydraulic				
Quench				
Turbine Lube				
Transformer				
Heat Transfer				
Gear				
Cutting				
Drawing				
Synthetic*				
Other*				

*Specify Type

4. WHAT IS THE BRAND NAME DESIGNATION OF THE OIL YOU WOULD LIKE TO PROCESS (e.g. Mobile DTE 24)? _____

5. WHAT TYPE OF MACHINERY IS PREDOMINANT IN YOUR FACILITY USING THE SUBJECT OIL?

Machine Tools ☐ Turbines ☐ Stamping ☐ Transformers ☐

Quench Tanks ☐ Plastic Injection Molding Equipment ☐

Other (Please Specify) _____

6. APPROXIMATELY HOW MUCH OIL DOES A RESERVOIR FOR A TYPICAL SYSTEM CONTAIN?

_____ gallons / _____ liters

7. HOW MANY SUCH SYSTEMS ARE THERE IN YOUR FACILITY?

_____ number

8. WHAT QUANTITY (YEARLY) IS BEING USED OR PURCHASED?

Less than 1,000 gals./ltrs. ☐

25,000 - 50,000 gals./ltrs. ☐

1,000 - 10,000 gals./ltrs. ☐

Over 50,000 gals./ltrs. ☐

10,000 - 25,000 gals./ltrs. ☐

Exact Quantity (if available) _____ gals./ltrs.

9. WHAT IS YOUR TOTAL OIL COST PER YEAR?

_____ x _____ = \$ _____
\$ Per gals./ltrs. Yearly Usage in gals./ltrs. Total Cost

10. IF YOU EMPLOY A CENTRAL RESERVOIR TO COLLECT WASTE OILS, WHAT SIZE IS IT?

500 gals./ltrs. ☐

10,000 gals./ltrs. ☐

1,000 gals./ltrs. ☐

Other _____ gals./ltrs.

- 10a. WHERE IS IT?

In Plant ☐ Underground ☐ Other (Please Specify) _____

- 10b. IS IT HEATED? Yes ☐ No ☐ IF YES, STATE TEMPERATURE _____°F/_____°C

- 10c. DOES THE WASTE OIL RESERVOIR CONTAIN A MIXTURE OF OILS OR PREDOMINANTLY ONE TYPE OF OIL? _____

- 10d. IF A MIXTURE, WOULD IT BE FEASIBLE TO ARRANGE TO SEGREGATE THESE OILS IF THERE WERE SUBSTANTIAL SAVINGS INVOLVED?

Yes ☐ No ☐

11. DO YOU OBTAIN OIL ANALYSIS* AND CHANGE TIME RECOMMENDATIONS?

Yes ☐ No ☐

- 11a. IF YES, FROM WHOM? _____

*If available, please attach a copy or a recent analysis of the oil to be processed.

12. HOW OFTEN ARE OIL CHANGES EXECUTED?

Every three months ☐ Yearly ☐
Every six months ☐ Other (Please specify) _____

13. ON THE AVERAGE, WHAT IS THE APPEARANCE OF YOUR OIL WHEN YOU DISPOSE OF IT?

Clear ☐ Very Cloudy ☐
Slightly Cloudy ☐ Muddy and Stratified with Contamination ☐

14. DOES YOUR OIL HAVE ANY SPECIAL PROBLEMS SUCH AS:

Water ☐ Entrained Gases ☐
High Dirt Content ☐ High Acid Content ☐
IF YES: Please answer Question 14a (A, B, C & D)
IF NO: Please answer Question 14a (A, B)

14a. CAN YOU DESCRIBE THE FOLLOWING LEVELS OF CONTAMINATION FOR BOTH NEW OIL AND OIL TO BE RECLAIMED?

	New Oil	Oil To Be Reclaimed
A. Approximate Water Percent		
B. Approximate Dirt Content		
C. Entrained Gases - Flash Point		
D. Acids: Total Acid Number (TAN)		

14b. DOES YOUR WASTE OIL CONTAIN ANY SOLVENT? Yes ☐ No ☐

14c. IF YES, PLEASE SPECIFY _____

15. WHAT IS THE MAJOR REASON FOR PLANNED OIL CHANGES?

Regular Scheduled Change ☐ High Dirt Content ☐
High Water Content ☐ Other (Please Specify) _____

16. HOW MUCH OIL DO YOU FEEL YOU CAN COLLECT PER WEEK FOR RECLAMATION?

_____ gallons/liters

17. WOULD YOU WANT THE OIL PROCESSED IN:

One Shift (8 Hours) ☐ Two Shifts ☐
Other (Specify Hours) _____

18. IS COOLING WATER AVAILABLE? IF YES:

PRESSURE _____ psi FLOW _____ gpm/lpm TEMP _____ °F/°C

19. WHAT POWER IS AVAILABLE?

440V ☐ 220V ☐ Max. Amperage Avail. _____ Hertz: 60 ☐ 50 ☐
550 Vac ☐ 500 Vac ☐ 415 Vac ☐ 380 Vac ☐ 210 Vac ☐ Other: _____ Phase: 3 ☐ 1 ☐

20. DO YOU PRESENTLY HAVE EQUIPMENT IN YOUR FACILITY WHICH IS DESIGNATED TO CLEAN, FILTER OR RECLAIM OIL?

Yes ☐ (Please answer Questions 21-25) No ☐ (Please skip to Question 26)

21. IF YES, WHAT IS THE NAME OF THE MANUFACTURER OF THIS EQUIPMENT, AND THE MODEL NUMBER?

Manufacturer Model Number

22. WHAT TYPE OF EQUIPMENT IS THIS?

Filtration System ☐ Vacuum Distillation System ☐
Centrifuge System ☐ Other (Please Specify) _____

23. HOW SATISFIED ARE YOU WITH THE PERFORMANCE OF THIS EQUIPMENT?

Very Satisfied ☐ Adequate ☐ Marginal ☐ Not Satisfied ☐

24. WHAT IS THE PROCESS RATE OF THIS EQUIPMENT IN GALLONS/HR.? — LITERS/HR.?

25. DO YOU FEEL THIS PROCESS RATE IS SUFFICIENT TO HANDLE YOUR PLANT'S REQUIREMENTS?

Yes ☐ No ☐

26. WHO IN YOUR ORGANIZATION IS RESPONSIBLE FOR CONTROLLING OIL USAGE AND COST?

27. DO YOU ANTICIPATE A NEED FOR INCREASED QUANTITIES OF OIL? IF SO, HOW MUCH?

5% ☐ 10% ☐ 15% ☐ Other _____%

28. ARE YOU INTERESTED IN PLANT WIDE RECLAMATION OR FOR CLEANING OIL IN A PARTICULAR PIECE OF EQUIPMENT? _____

.....

Thank you for your assistance in helping us to more accurately respond to your needs.

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END

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DTIC